AVASTOR

XD5

DESKTOP RAID

MAC OS USER MANUAL

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GENERAL INFORMATION

COPYRIGHT

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The product information provided in this manual is subject to change without prior notice and does not represent a commitment on behalf of Avastor. Avastor assumes no liability or responsibility for any errors that may appear in this manual.

NOTICES

Any loss, corruption, or destruction of data is the sole responsibility of the user of the XD5. Under no circumstances will Avastor be held liable for the recovery or restoration of any data.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

PRECAUTIONS

- The main circuit board of the XD5 is susceptible to static electricity. Proper grounding is required to prevent electrical damage to the XD5 or other connected devices, including the host computer.

- Keep the XD5 away from liquids.

- Do not place the XD5 close to magnetic devices, high-voltage devices, or near a heat source.

- Make sure Power Selector Switch is positioned to the correct voltage.

- Do not attempt to service this XD5 yourself. Please contact Avastor Technical Support.

- Do not block ventilation. Proper airflow is required to ensure reliable operation and to prevent overheating.

- RAID 1, 10, 3 and 5 modes offer data redundancy and fault tolerance. In modes CLEAR, COMBINE and RAID 0, a failure of any drive will cause the loss of some or all stored data.

INTRODUCTION

The XD5 3.5-inch 5-Drive RAID System with a hardware RAID controller provides extended storage capacity with selectable RAID configuration options in a compact, desktop storage device.

The XD5 allows easy configuration of RAID Modes: Clear (JBOD), Combine, RAID 0, RAID 1, RAID 10, RAID 3 and RAID 5.

Please review the RAID mode options under "RAID MODES" in this manual to choose the most suitable RAID mode for your application.

FEATURES

- Supports 3.5-inch SATA II compliant drives, fully backward compatible with SATA 1.0 and SATA 1.0a compliant drives
- Connects via Super-Speed USB 3.0, IEEE 1394b (FireWire 800) or IEEE 1394a (FireWire 400), or eSATA
- Supports rebuild under Raid 1, 10, 3 and 5 modes
- Configures RAID modes easily using hardware RAID mode selector switches
- Monitors XD5 status via LED indicators
- Power XD5 via internal high wattage power supply
- Optimum temperature maintenance with two large (6CM) ultra-quiet fans

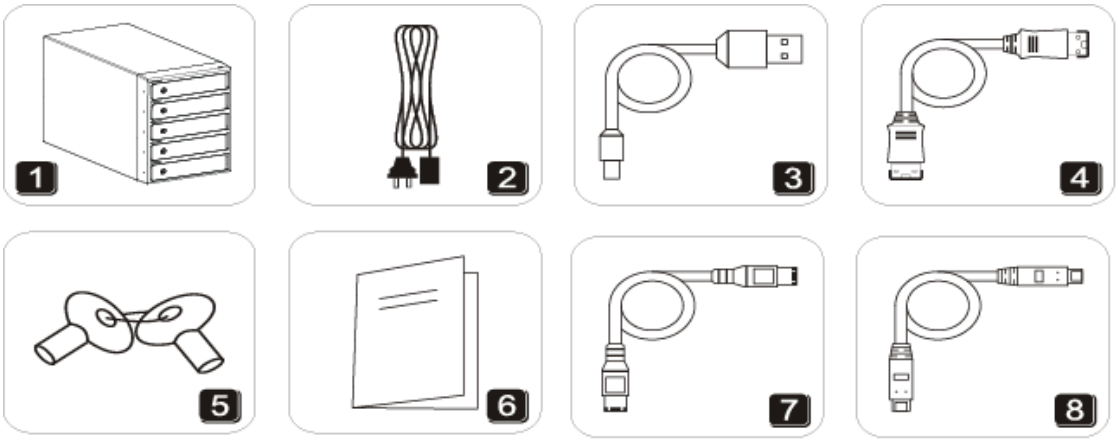
SYSTEM REQUIREMENT

To use the XD5, the minimum system configuration of the host computer is the following:

- Macintosh PowerPC or Intel processors
- 256MB of RAM or more
- Mac OS X 10.4 or higher
- One available USB 2.0/3.0, eSATA, FireWire 800 or 400 port
- Time Machine Compatible

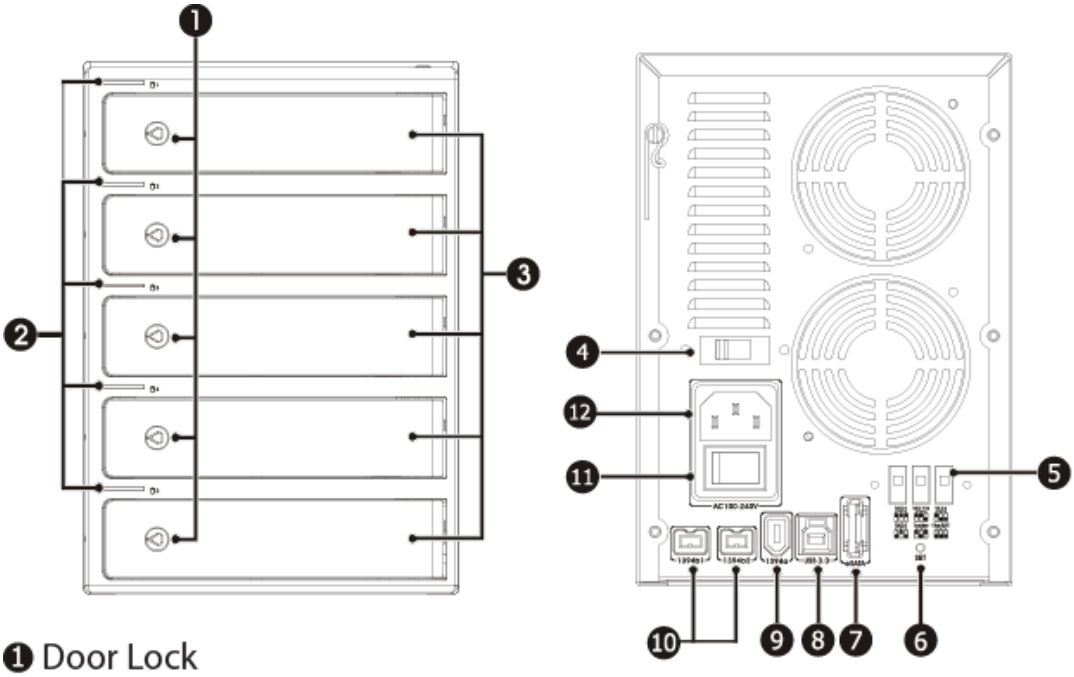
SYSTEM UNIT VIEWS

PACKAGE CONTENTS



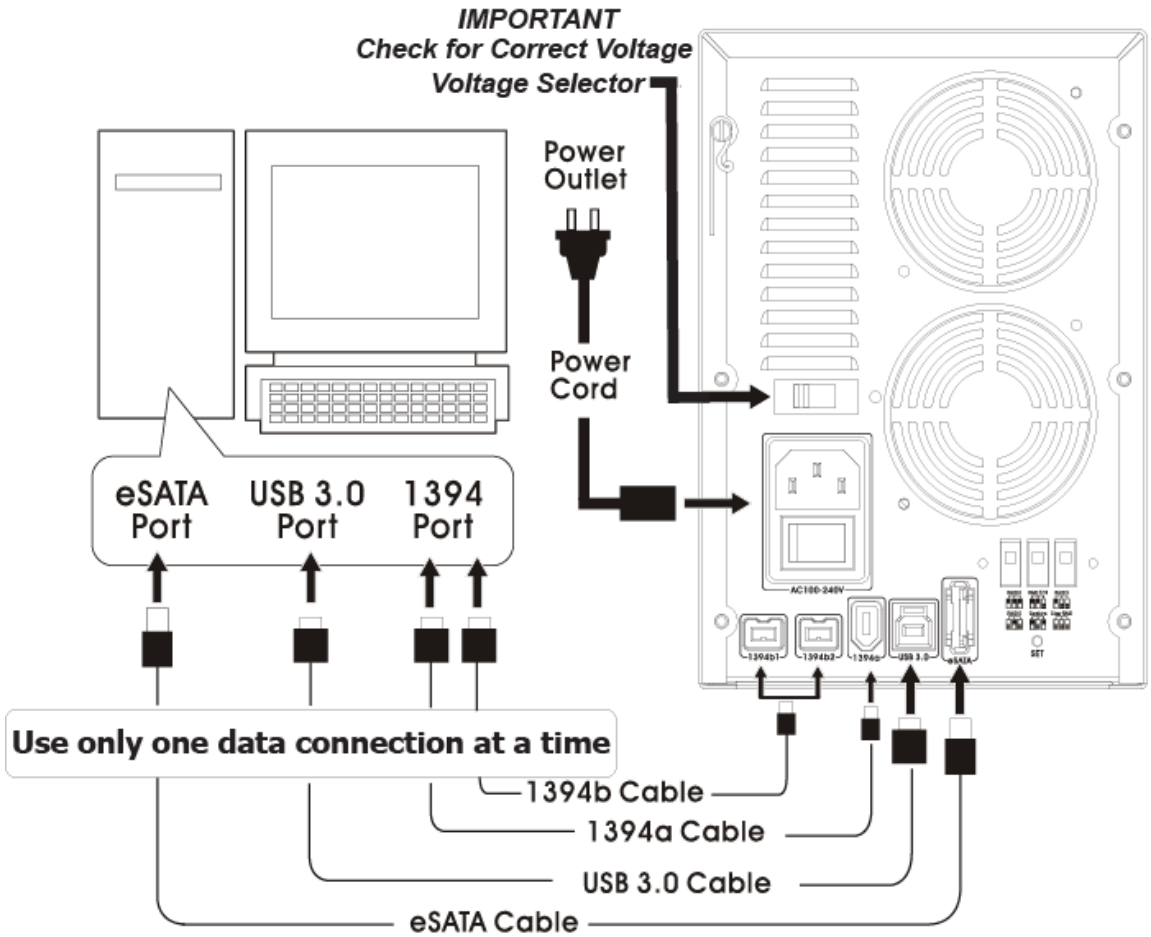
1. XD5 RAID System 2. Power Cord 3. USB 3.0 Cable
4. eSATA Cable 5. Drive Lock Key 6. Quick Start Guide
7. FireWire 400 (1394a) cable 8. FireWire 800 (1394b) cable

HARDWARE GUIDE



❶ Door Lock
❷ Drive Status / HDD Activity LED
❸ Drive Slot
❹ Voltage Selector
❺ RAID Mode Selector
❻ Set Button
❼ eSATA Port
❽ USB 3.0 Port
❾ FireWire 400 Port
❿ FireWire 800 Ports
⓫ Power Switch
⓬ Power Cord Connector

CONNECTING TO A COMPUTER



CONNECTING THE XD5

1. Check the Voltage Selector Switch for proper setting. Connect the AC Power Cord to the XD5.

2. Insert the USB 3.0, eSATA, FireWire 800 or 400 cable into the corresponding port of the XD5 and the host computer.

   NOTE: The XD5 should only be connected to a host computer via one type of data cable. Connecting the XD5 to a computer simultaneously via two or more data cables is not recommended and can cause data loss.

3. Press the Power Switch to turn on the XD5.

4. When powered on, the disk LED lights (blue) will illuminate when the drives are detected and powered on.

5. You are now ready to begin using your XD5.

RAID MODE CONFIGURATION & REBUILD

The XD5 standard configuration is configured for RAID 5 using five drives. This mode improves speed and combines the drives into one large drive with redundancy if any one of the drives were to fail.

Please review the RAID mode options under “RAID Configurations” in this manual to choose the most suitable RAID mode for your application.

SETTING AND CHANGING THE RAID MODE

Please backup all data before setting or changing RAID mode. All data will be lost or deleted when RAID mode is changed.

NOTE: All RAID mode settings and changes are made from the Clear RAID mode. Ensure the RAID mode is set to Clear RAID or if you are changing the RAID mode, ensure the RAID mode has been changed to Clear RAID mode.

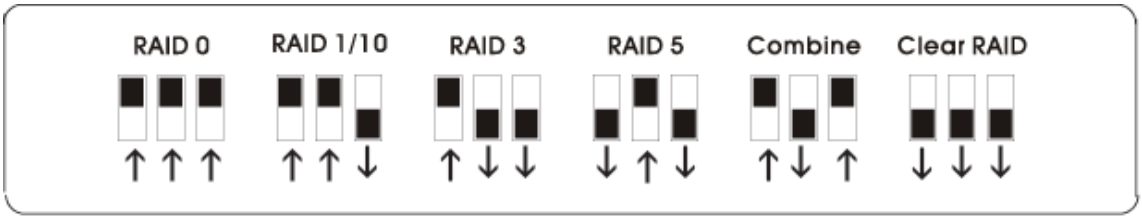
Setting the Clear RAID Mode

Move the **3 RAID selector switches** to the Clear RAID mode position (down/down/down). Power the XD5 to off. While pressing the **SET button**, power the XD5 to on, continue to press the **SET button**. The XD5 will **beep** once, confirming power is on and RAID mode change is in progress. After 5-10 seconds the XD5 will **beep** once again, confirming the RAID mode has been changed, release the **SET button**. The XD5 is now in Clear RAID mode.

Setting the RAID Mode or Changing the RAID Mode

Ensure the RAID mode is set to Clear RAID or if you are changing the RAID mode, ensure the RAID mode has been changed to Clear RAID mode.

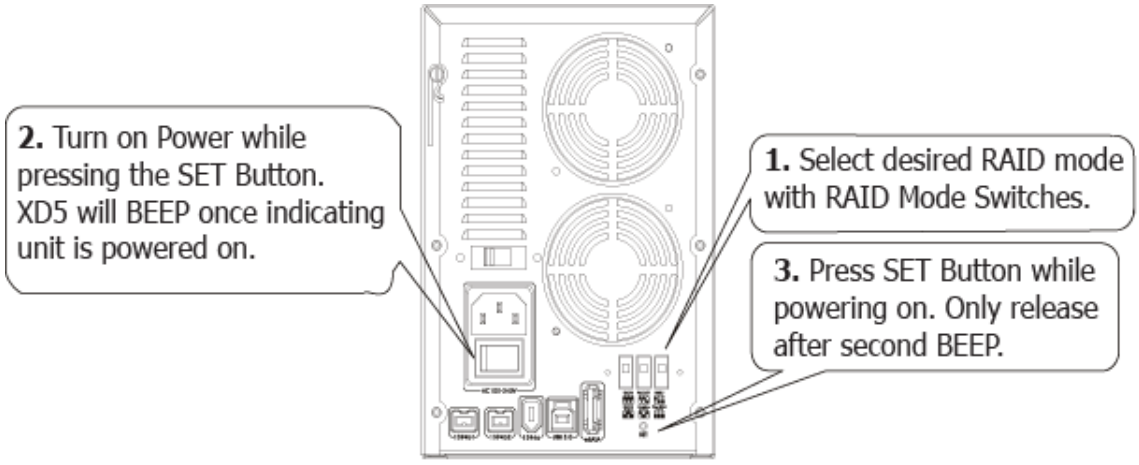
From the Clear RAID mode, set the **3 RAID Mode selector switches** to the desired RAID mode. See the chart below for the RAID Mode Selector Switch position setting.



SETTING AND CHANGING THE RAID MODE (Cont.)

Once the **RAID selector switches** are set to the desired mode, while pressing the **SET button**, power the XD5 to on, continue to press the **SET button**. The XD5 will **beep** once, confirming power is on and RAID mode change is in progress. After 5-10 seconds the XD5 will **beep** once again, confirming the RAID mode has been changed. Release the **SET button**.

NOTE: Whenever the RAID mode is changed, always change to the Clear RAID mode before changing RAID modes. The XD5 should never be changed to a different RAID mode without changing to Clear RAID mode first.


2. Turn on Power while pressing the SET Button. XD5 will BEEP once indicating unit is powered on.
1. Select desired RAID mode with RAID Mode Switches.
3. Press SET Button while powering on. Only release after second BEEP.

After the RAID mode has been changed, the drive(s) in the new RAID array must be reformatted.

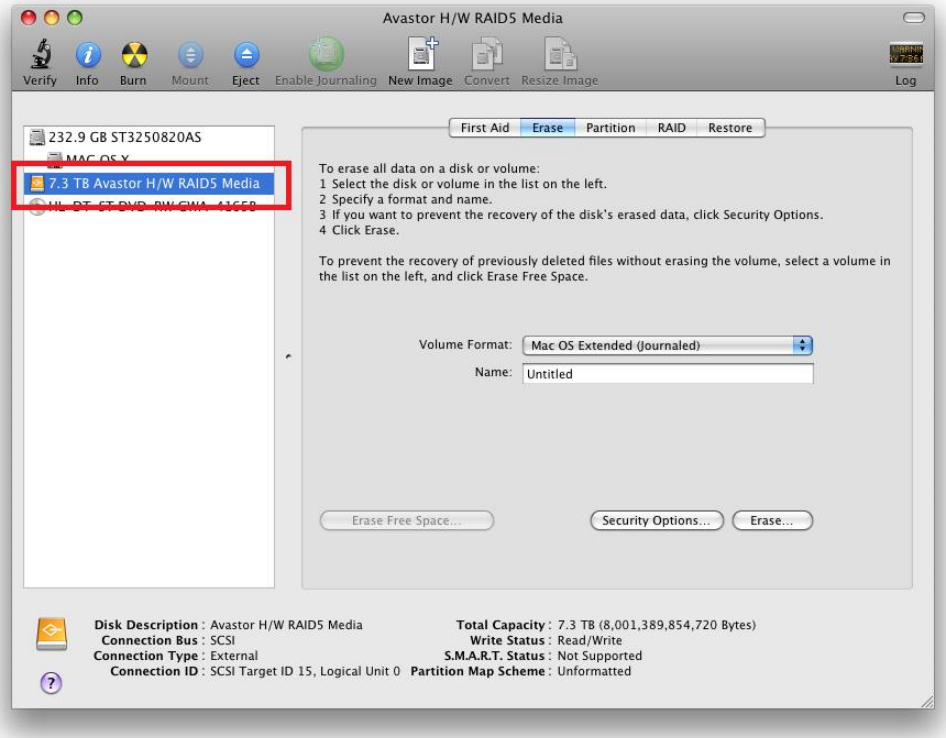
FORMATTING DRIVES

NOTE: Whenever the RAID configuration is changed, the drive(s) will need to be reformatted using the new RAID configuration.

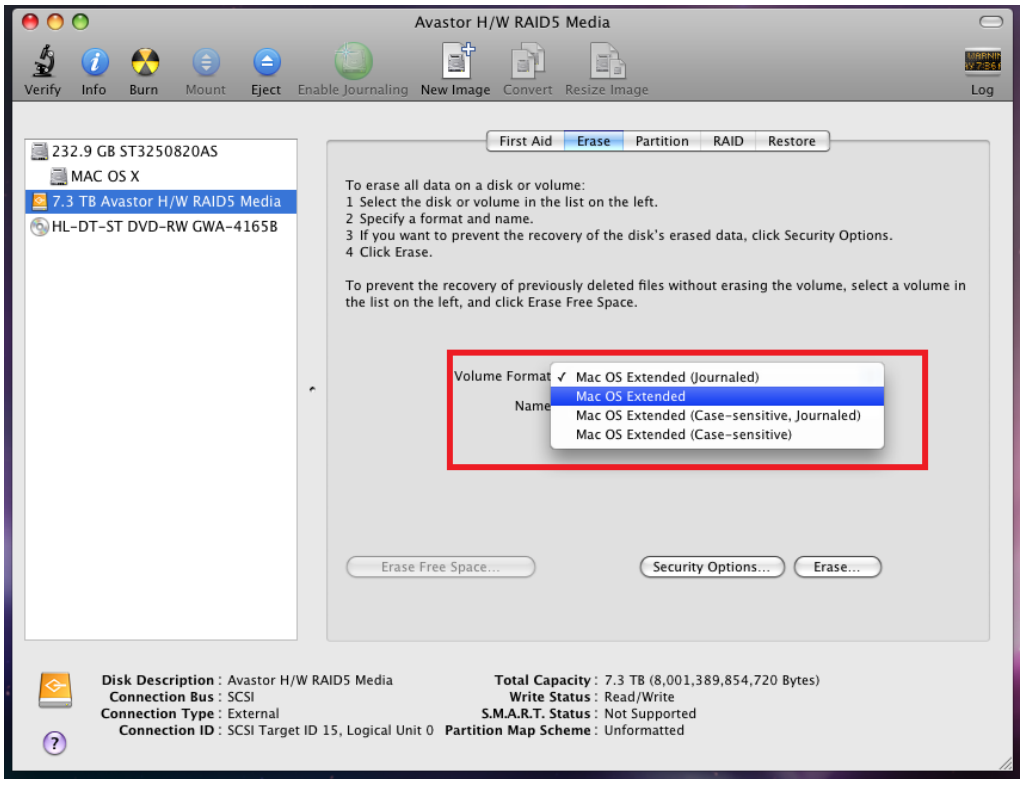
Formatting using Mac OS 10.4 and Higher

1. Locate **Disk Utility** by using Spotlight in the top right corner of your screen. Search for Disk Utility and select the application.

2. **Select** the unformatted **storage device** in the window on the right.


Avastor H/W RAID5 Media
Verify
Info
Burn
Mount
Eject
Enable Journaling
New Image
Convert
Resize Image
Log
232.9 GB ST3250820AS
7.3 TB Avastor H/W RAID5 Media
First Aid
Erase
Partition
RAID
Restore
To erase all data on a disk or volume:
1 Select the disk or volume in the list on the left.
2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Volume Format:
Mac OS Extended (Journaled)
Name:
Untitled
Erase Free Space...
Security Options...
Erase...
Disk Description : Avastor H/W RAID5 Media
Connection Bus : SCSI
Connection Type : External
Connection ID : SCSI Target ID 15, Logical Unit 0
Total Capacity : 7.3 TB (8,001,389,854,720 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

3. Under **Volume Format**, select the type of format you would like to use.


Avastor H/W RAID5 Media
Verify
Info
Burn
Mount
Eject
Enable Journaling
New Image
Convert
Resize Image
Log
232.9 GB ST3250820AS
MAC OS X
7.3 TB Avastor H/W RAID5 Media
HL-DT-ST DVD-RW GWA-4165B
First Aid
Erase
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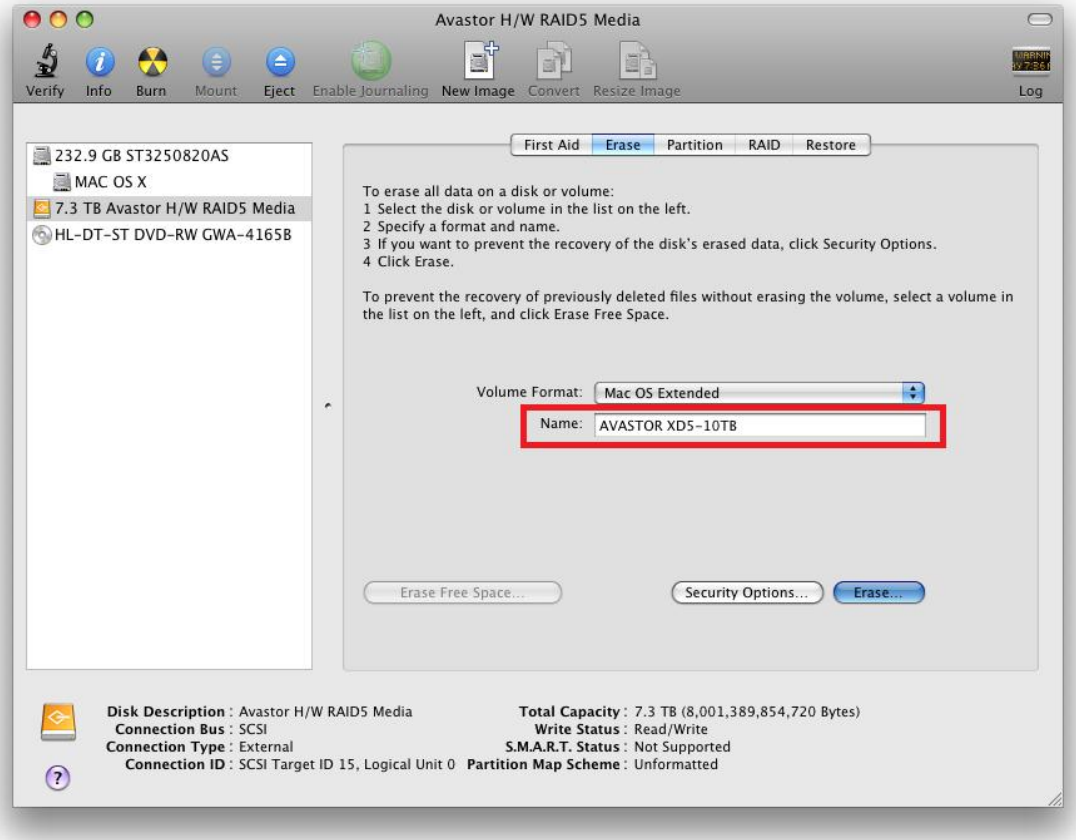
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Volume Format
Name
Mac OS Extended (Journaled)
Mac OS Extended
Mac OS Extended (Case-sensitive, Journaled)
Mac OS Extended (Case-sensitive)
Erase Free Space...
Security Options...
Erase...
Disk Description : Avastor H/W RAID5 Media
Connection Bus : SCSI
Connection Type : External
Connection ID : SCSI Target ID 15, Logical Unit 0
Total Capacity : 7.3 TB (8,001,389,854,720 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

4. **Name** the device.


Avastor H/W RAID5 Media
Verify
Info
Burn
Mount
Eject
Enable Journaling
New Image
Convert
Resize Image
Log
232.9 GB ST3250820AS
MAC OS X
7.3 TB Avastor H/W RAID5 Media
HL-DT-ST DVD-RW GWA-4165B
First Aid
Erase
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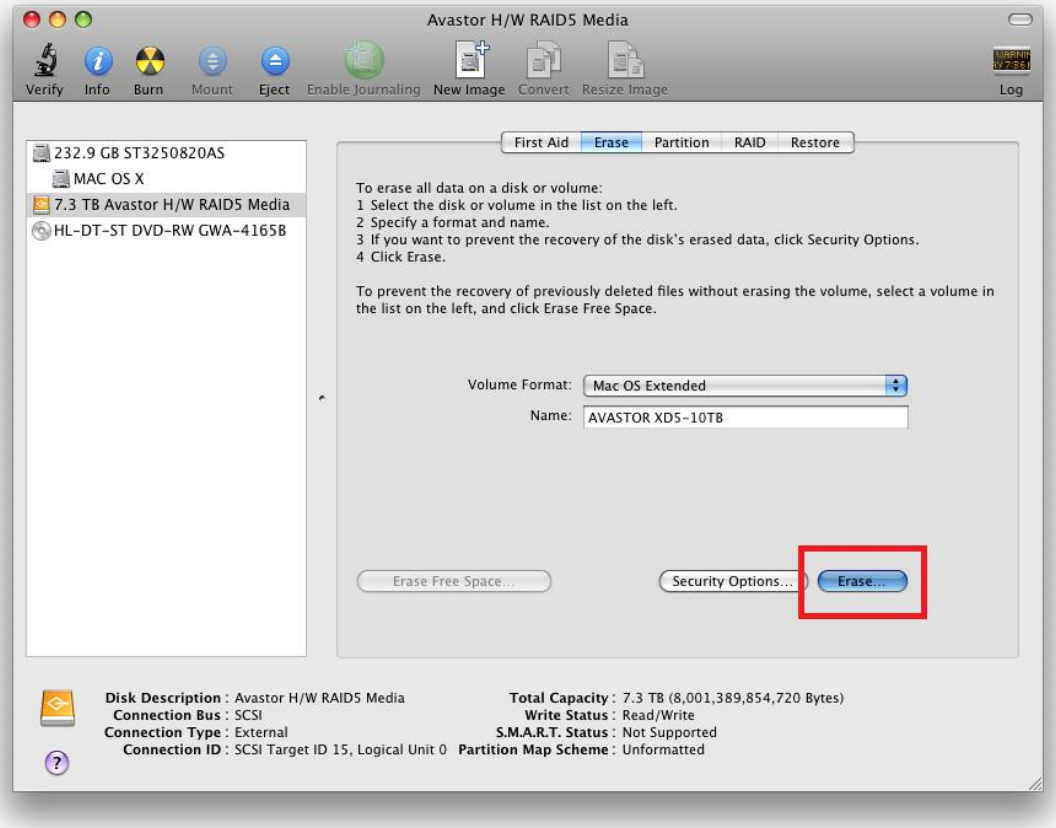
Restore
To erase all data on a disk or volume:
1 Select the disk or volume in the list on the left.
2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Volume Format: Mac OS Extended
Name: AVASTOR XD5-10TB
Erase Free Space...
Security Options...
Erase...
Disk Description : Avastor H/W RAID5 Media
Connection Bus : SCSI
Connection Type : External
Connection ID : SCSI Target ID 15, Logical Unit 0
Total Capacity : 7.3 TB (8,001,389,854,720 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

5. Once format and name has been selected, **click Erase**.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2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Volume Format:
Mac OS Extended
Name:
AVASTOR XD5-10TB
Erase Free Space...
Security Options...
Erase...
Disk Description : Avastor H/W RAID5 Media
Connection Bus : SCSI
Connection Type : External
Connection ID : SCSI Target ID 15, Logical Unit 0
Total Capacity : 7.3 TB (8,001,389,854,720 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

6. A new window will appear. **Click Erase** to confirm formatting process.
7.

Erase Disk
Erasing a disk will destroy all information on the disk.
Are you sure you wish to erase the disk "AVASTOR XD5-10TB"?
Cancel
Erase

8. Once formatting is completed, the newly formatted storage device will appear on your desktop. Your device is ready to use.

RAID MODE FAULT TOLERENCE

RAID 0
If any of the drives fail all, the data will be lost. There is **NO** redundancy in RAID 0. Replace the failed drive and reset the RAID mode.
RAID 1, 10, 3, and 5
If one drives fails, the data can be rebuilt. The XD5 will begin the rebuild mode automatically if a spare drive is installed or the XD5 will begin the rebuild mode when the failed drive is replaced.
Clear RAID (JBOD)
If any of the drives fail, only the data on the failed drive will be lost, none of the other drives are affected. Replace the failed drive and format the new drive.

REBUILD

RAID Rebuild with Spare Drive

If your RAID configuration is RAID 1, RAID 10, RAID 3 (3 or 4 drives) or RAID 5, (3 or 4 drives) there is at least one spare drive slot that can be use for a spare auto-rebuild drive.

To configure the RAID with a spare auto-rebuild drive, first configure the RAID mode. Once the RAID mode has been configured, install a spare drive in the next unused drive slot.

NOTE: The spare drive must be equal to or larger than the largest drive in the array. The spare does not need to be formatted. The spare drive should be erased, any data on the spare drive will be lost when rebuild begins.

Should a drive fail or become degraded, the XD5 alarm will sound **beep** and the LED of the faulty drive will flash red. Press the **SET button** to turn off the alarm. The RAID array will start rebuilding automatically using the installed spare auto-rebuild drive.

The rebuild is complete when the spare drive stops flashing red and turns blue.

RAID Rebuild with No Spare Drive

Should a drive fail or become degraded, the XD5 alarm will sound **beep** and the LED of the faulty drive will flash red.

Power the XD5 off and remove the faulty drive.

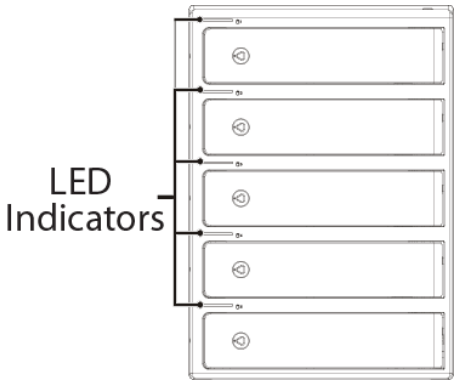
Install a known good drive into the same drive slot from which the faulty drive was removed.

NOTE: The new drive must be equal to or larger than the largest drive in the array. The new drive does not need to be formatted. The new drive should be erased; any data on the new drive will be lost when rebuild begins.

The RAID array will start rebuilding as soon as the XD5 is powered on.

The rebuild is complete when the new drive stops flashing red and turns blue.

LED INDICATORS



Indicators		Color
Disk Not Detected		**Off**
Disk Detected/Power On		**Blue**
Data Access		**Flashing Blue**
Disk Failure		**Flashing Red**
Disk Rebuild	**Source Disk**	**Flashing Blue**
	Rebuild Disk	**Flashing Red**

DISKS SUPPORTING RAID CONFIGURATION

RAID configurations	Number of Disks in RAID
RAID 0	**1 to 5**
RAID 1	**2**
RAID 10	**4**
RAID 3	**3 to 5**
RAID 5	**3 to 5**
Clear RAID	**1 to 5**

RAID CONFIGURATIONS

A Redundant Array of Independent Disks (RAID) is a system that utilizes multiple hard drives to share or replicate data among the disks. The benefit, depending on the selected RAID configuration (combinations of disks), is one of increased data integrity, fault-tolerance, throughput or capacity, when compared to single drives.

RAID 0

RAID 0 - also known as Striping, is a performance-oriented, non-redundant data mapping technique. It combines multiple hard drives into a single logical unit. Instead of seeing several different hard drives, the operating system sees only one large drive. RAID 0 strips or splits data across two disks simultaneously; the speed of operation is enhanced compared to other RAID configurations.

RAID 0 is used by those wanting the most performance out of two or more drives. Users commonly use RAID 0 for quick data transfers from one source to another. A backup of the data should always be maintained.

RAID 0 should never be used for mission critical applications, if one disk fails all data on all installed disks will be lost.

RAID 1

RAID 1 - also known as Mirroring, consists of two drives storing duplicate copies of the same data. In this mode, the same data is simultaneously written to two drives. Thus, the storage capacity of a two-drive array is combined into a single drive and the capacity is limited to the size of the smallest drive or half the capacity if the two drives are the same size.

Uses include removing one of the mirrored drives and allowing the array to rebuild on a third drive. If a drive fails, there is no down time, as the data still

exists on the backup drive. Important files (accounting, financial, personal records) are commonly stored using RAID 1.

In RAID 1 mode, if one of the disks fails, the data is still available.

RAID 10

RAID 10 offers the combined benefits of RAID 1 and 0 with twice the capacity of RAID 1. Four drives are controlled as a single larger drive. RAID 10 is a pair of RAID 1 pairs for higher failure tolerance. The two RAID 1 sets are combined in a RAID 0 configuration for improved read and write performance.

RAID 10 is an excellent solution for Audio/Video professionals who require high performance, as well as a high fault tolerance. Great for live broadcast/remote recording.

RAID 10 can sustain one drive failure in each RAID 1 pair. RAID 10 offers fast performance with superior redundancy.

RAID 3

RAID 3 is the least used of the RAID modes. RAID 3 uses one dedicated drive in the array to store parity data[1]. Bytes of data are split and stored on the remaining drives of the array. It offers high read and write transfer rates with a high level of fault tolerance. A minimum of three drives is required.

Write performance can be slower than RAID 5 due to parity calculation overhead and the bottleneck of a dedicated parity drive.

RAID 5

RAID 5 parity data is spread across all drives versus being stored in a single drive as with RAID 3. RAID 5 reserves space equal to the capacity of one drive in the array for parity data[1]. Read data transactions are fast while write data transaction are somewhat slower than RAID 10 but faster than RAID3. In the event of a single drive failure, data can still be accessed.

One of the most common and versatile RAID modes, RAID 5 is ideal for balancing performance, storage capacity and fault tolerance.

COMBINE (Non-RAID)

COMBINE - also known as Large or Span, provides another maximum capacity solution. COMBINE combines multiple hard drives into a single logical unit. Unlike RAID 0, COMBINE writes data to the first drive until it reaches full capacity then data is written to the second drive, and so on up to 5 drives. COMBINE provides the maximum possible storage capacity, but does not increase performance.

Clear RAID (Non-RAID)

Clear RAID - also known as JBOD (Just a Bunch of Drives) refers to a group of hard drives. In CLEAR RAID, the number of logical drives is equal to the number of physical drives. This mode allows the XD5 to operate as a multi-drive storage enclosure, but provides no data redundancy. Each drive will be shown as a separate drive up to 5 drives. If one drive fails, the others are not affected.

[1] Parity data is used by some RAID levels to achieve redundancy. If a drive in the array fails, remaining data on the other drives can be combined with the parity data (using the Boolean XOR function) to reconstruct the missing data. Parity data, quite simply, is the result of a quick equation. Here's a simple way to think of parity: 6 + 3 = 9

Imagine the 6 is on one hard drive, the 3 on another, and the 9 on a third. The 3 and the 6 are your data, but the 9 is the result of a simple equation. If a hard drive was to fail, and you lost for example, the 3, you could do a simple calculation to retrieve the 3 (9 minus 6).

FAQ

CHOOSING THE RAID MODE

Q: How do I choose the proper RAID configuration for my XD5 based on the tasks I need to perform?
A: The XD5's selectable RAID configuration settings can help you administer how the XD5 handles stored data. It is recommended you choose the RAID configuration that is most applicable to your task. The most common factors affecting the choice of which RAID mode to choose are capacity, speed, and data protection. For example, if you are using the XD5 to store entertainment media or for backup, RAID 5 mode can be used; it offers the combined capacity of the multiple drives while writing to one drive at a time. If your work requires continuous backup of the data and redundancy, then RAID 10 would be the best choice, however capacity is reduced to the capacity of the 2 smallest drives. If you need the faster data access, then the enhanced speed of RAID 0, which combines the drives for maximum capacity and writes data simultaneously to the drives, may be the most appropriate.

DAISY CHAINING

Q: Because there are two FireWire ports on the XD5, I connected them to two external devices. Why can't I see these additional external devices on my host? I'm using the USB connection from the XD5 to my computer.
A: In order for the XD5 to work properly, one of the FireWire ports needs to be connected to the computer, and the other one can be connected to an external device. The XD5 should only be connected to a host computer via one type of interface cable. Connecting the XD5 to a computer simultaneously via two or more interface cables is not recommended and can cause data loss. More instruction on daisy chaining FireWire devices can be found at Avastor on You Tube. http://www.youtube.com/watch?v=FVA6rzaOVqI&tracker=False

DISCREPANCY IN DRIVE CAPACITY

Q: I have a 1TB drive, why does the XD5 report the drive available space as less than 1TB?

A: Your computer reports the capacity of a hard drive in binary, compared to the decimal system used to identify the capacity of hard drives.

Binary, a kilobyte is equal to 1024 bytes

Decimal, a kilobyte is equal to 1000 bytes

Therefore, the binary system of the computer divides the decimal capacity of the drive by 1024 instead of 1000, thereby the reported size is reduced. An in-depth description of capacity discrepancy can be found at www.avastor.com/support/capacity.pdf.

REBUILD

Q: Does the XD5 have to be connected to the host computer when it is in rebuild mode?

A: No, it does not have to be. The XD5 can support offline rebuild in RAID 1, 10, 3, 5 which means it can perform the rebuild function without being connected to a host computer.

CAPACITY OVER 2TB

Q: What is the "Over 2TB" option for in the PC's version of RAID Master?

A: The maximum storage capacity is affected by the Windows operating system. NTSF formatted drives on Windows XP are only supported up to 2TB. NTSF formatted drives on Windows Vista and 7 are supported up to 16384 TB. If the combined drive capacity is over 2TB and the operating system can support drives of more than 2TB, check the "Over 2TB" option under the "Configuration" option tab.

The XD5 requires OS 10.4 and above for MAC, which supports over 2TB drives. the "Over 2TB" option does not appear on the RAID Master for MAC.

Technical Data

Model Name	RS-S2TJ
Interface	USB 3.0 / eSATA / FireWire 800/ FireWire 400
Connector	eSATA x 1, USB 2.0 x 1, 1394a 1, 1394b x 2
Drive Support	3.5" SATA Drive Identical drives recommended – same manufacturer, capacity and RPM
Data Transfer Speed	eSATA: up to 3Gbit/sec 1394b: up to 800Mbit/sec 1394a: up to 400Mbit/Sec USB3.0: up to 5Gbit/Sec
RAID Mode	Clear RAID (Non RAID), Combine (Non RAID), RAID 0, RAID 1, RAID 10, RAID 3, RAID 5
LED Indicators	Power / Connection / Status / Access / Rebuild
Power Supply	Input: AC 100~240V Peak current: 5A
Dimension	7.4" 188mm(L) x 5.1" 128mm (W) x 10.7" 271mm (H)
Weight (no drives)	9.5 Lbs. 4.3 Kgs
Certification	CE, FCC, RoHS